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THE HARASSED DECISION MAKER:
TIME PRESSURES, DISTRACTIONS,
AND THE USE OF EVIDENCE

Peter Wright

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Abstract

This study was concerned with the dominant simplifying strategies people use in adapting to difficult information processing environments. The hypothesis tested was that judges operating under time pressure or distraction would tend to systematically place greater weight on negative evidence than counterparts in less strainful conditions. Six groups of subjects were presented five pieces of information to assimilate in evaluating cars as purchase options. Three groups operated under varying time pressure conditions and three groups under varying levels of distraction. Data usage models assuming disproportionately heavy weighting of negative evidence provided best-fits to a substantially higher number of subjects in the high time pressure and moderate distraction conditions. Subjects also attended to fewer data dimensions in these conditions.

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Department of Business Administration, University of Illinois, Urbana

Perhaps the most pervasive task people face in everyday life is trying to use disparate pieces of information to choose among alternatives: consumer goods, investment portfolios, political candidates, etc. The individual equipped with limited information handling ability must try to balance his desire to make accurate choices which maximize his resulting benefits and his equally urgent needs related to the cognitive strains of the decision task. Reviews by Slovic and his associates (Slovic, 1972; Slovic and Lichtenstein, 1971) suggest some of the diverse ways judges may simplify data handling chores. These reviews also demonstrate that while some structural properties of the available information have been varied in judgment process research, the adaptations judges make under high information load have received surprisingly little empirical attention.

A decision maker's need to simplify should become more urgent when he must operate under a heavy information load. Information load is generally conceived as the amount of data to be processed per unit of time. An increase in information load could therefore result from either increasing the amount of data with which a person must cope or decreasing the time available for processing. Amount of data can itself be increased by either increasing the number of decision-relevant pieces of evidence or by increasing the total amount of information in the immediate environment such that the individual becomes distracted.

High information load is perhaps the rule rather than the exception for consumers shopping in noisy, crowded, information-packed retail outlets or managers making decisions under the pressure of deadlines.

Simplifying Strategies

Faced with a decision task of challenging complexity, an individual may try to restructure that task into a simpler one. For example, he can try to defer an impending decision deadline, physically remove the source of the distraction, or move himself to a more peaceful locale. Even when a person's ability to control time pressure or interference ~~are~~ is limited, he may still restructure his task by restricting his attention to certain portions of the incoming data. He may exclude data about less relevant dimensions from consideration, even though he would consider those dimensions sufficiently important to input under less taxing conditions. Or he may focus attention on data in certain regions of each dimension. For example, multiattribute options usually offer outcomes which potentially range from highly desirable to highly undesirable. Pieces of data inform the decision maker of the positive or negative implications of choosing an option. A person may limit his data intake by becoming especially attentive only to data about possible negative (or positive) outcomes.

In simplifying as proposed, a decision maker accepts some distortioninto his subjectively ideal judgment policy. If he ignores entire dimensions of evidence, he chooses in ignorance of what outcomes to expect on those dimensions. The dimensions he attends to will consequently have relatively greater impact on his judgments than they normally would. If he focuses on negative evidence, he sacrifices

awareness of the extent of positive outcomes to be expected, and vice versa. It would be surprising if these two strategies aren't used concurrently, i.e., the harassed decision maker limiting attention to negative (or positive) evidence on a reduced number of dimensions.

Whether he is more comfortable ignoring positive or negative evidence probably depends on the payoff structure of the task. Kanouse and Hanson (1971) reviewed several streams of research suggesting that judgments about objects with good and bad attributes are more heavily influenced by negative data. Explanations for this "negativity bias" uniformly stress the situational salience of costs or rewards. For example, both Webster (1964) and Canavan (1969) found a negative bias when the decision maker's reward system heavily penalized his false positives while ignoring his successes. In many decision tasks, no such well defined, externally imposed payoff structure exists. Even so, conditions surrounding the judgment may induce the simplifying judge, who feels he must sacrifice some of the available input, to ignore the positive evidence and insure he is aware of impending negative consequences. One such facilitating condition may be that the option(s) evaluated possess both positive and negative features (Abelson and Kanouse, 1966). Other research suggests a negative bias might emerge where personal investments (hence, personal losses) are involved and where the judgmental context implies final commitment to the chosen option (Slovic, 1969; Einhorn, 1971). While many judgment contexts fit these requirements, the consumer car-buying decision was chosen as representative for this study.

At its extreme, disproportionately heavy weighting of negative evidence amounts to using a conjunctive strategy (Coombs, 1964) with multiple cutoffs separating negat ve from positive outcomes (and hence, negative from positive evidence.). Discovery of a datum suggesting an option doesn't surpass any cutoff results in outright rejection. Einhorn (1971) has suggested (but not demonstrated) that a conjunctive strategy is an attractive simplifying procedure relative to a linear compensatory strategy. While the rationale offered is plausible, Wright's (1974) results caution that executing a conjunctive strategy may not necessarily be viewed as easy by the decision maker. In any case, a person actually using a compensatory strategy may temporarily adjust his data treatment so that negative data is accentuated without going to the extreme of a strictly noncompensatory conjunctive rule. Unfortunately, when the judge under observation makes errors in translating from input data to output judgments it is difficult to distinguish these two cases.

The hypothesis is that disproportionately heavy weighting of negative evidence will occur frequently among persons making the type of judgment described (personal investment, negative outcomes possible, final commitment) under time pressure or when distracted. Under more leisurely conditions, no evidence usage pattern will be dominant since individual utility functions will vary. To test this hypothesis, mathematical models representing an "unbiased", a "negatively biased", and a "positively biased" data usage scheme were formulated. All were variations of the general additive compensatory model (Slovic and Lichtenstein, 1971):

$$J(X) = b_1X_1 + b_2X_2 + b_iX_i + \ldots b_kX_k, \quad i = 1,2,\ldots,k \qquad (1)$$

where $J(X)$ is an overall (numerical) judgment of an option; X_i is a (numerical) scale value for that option on the ith dimension; and b_i is the weight given the ith dimension as a whole. When the judgment is recorded on a response scale and the stimuli expressed as levels on descriptive scales, numbers are assigned to the scale points for entry in this model. The variations contrasted here concerned only the scale values on the right side of Eq. 1.

An "unbiased" model (where negative and positive evidence is equally weighted) was represented by assigning the numbers 1 - 7 to the seven levels along each descriptive dimension (e.g., "greatly below average" = 1; "greatly above average" = 7). Two "negative bias" models were used. In one (Eq.2) the scale values $X_i = 1,\ldots,7$ were transformed into $\log X_i$. The effect was that differences between the scale point values increased nonlinearly as the descriptive scales became increasingly negative (e.g., log 1 = 0; log 2 = .301; log 3 = .477, ..., log 6 = .778; log 7 = .845).

$$J(X) = b_1\log(X_1) + b_2\log(X_2) + b_i\log(X_i) + \ldots + b_k\log(X_k), \; i > 0 \qquad (2)$$

Since the descriptive scales used had an "average" midpoint, negative evidence might have been construed as evidence implying below average features. The second "negative bias" model transformed only the below average section of the stimulus scales so that the effective scale values were 0, 4, 6.5, 8, 9, 10, 11. The first "negative bias" model described (Eq.2) will be labeled NEG_1 and the second NEG_2.

Two "positive bias" models were also used. In POS_1 (Eq. 3) differences between the scale values increase nonlinearly as the scales become increasingly positive.

$$J(X) = -b_1 \log(a - X_1) - b_2 \log(a - X_2) - \ldots - b_k \log(a - X_k), \quad (3)$$

In Eq. 3, a is an arbitrary constant set above the highest scale value (7 in this case) so the predicted judgment remains finite. POS_2 transformed only the above "average" section of the stimulus scales so the effective scale values were 1, 2, 3, 4, 5.5, 8, 12.

Each of these models was fit to the data of individual subjects making judgments under different time pressure or distraction conditions. Finding that substantially more of the "harassed" subjects' data usage processes are best matched by $~~POS_1~~$ NEG_1 or NEG_2 would be interpreted as support for the hypothesis.

Method

The Judgment Task

Subjects were given descriptions of thirty hypothetical car models. Information on five attributes of each car was given: selling price, ease of handling, cost of maintenance, styling, and riding comfort. A pilot study had established these as generally salient in evaluating cars. The information was expressed as ratings on seven-point scales with endpoints labeled "greatly below average" and "greatly above average"; the midpoint was labeled "average". The descriptions were created so that each attribute appeared an approximately equal number of times and so that each car was a mixture of positive and negative attributes. This was important since the models won't discriminate very well where the evidence about an option is fairly homogeneous. Subjects were told the norms implied by the "average" label referred

to the class of cars selling for less than $4000. They were asked to treat the available data as credible and as constituting their own beliefs about the case.

Subjects judged each car according to the likelihood they would purchase such a car for personal use upon graduation from college. The context was thus one of final preference rather than preliminary screening, and specified an act rather than a general evaluation. In the "time pressure" study, judgments wererecorded on a four point scale ranging from "extremely high probability" to "extremely low probability". In the "distraction"study, the scale used to record judgments was a seven point bipolar scale with endpoints labeled "likely" and "unlikely".

Time Pressure Treatments

Three variations in time pressure were created. In the "high time pressure" (HTP) condition, subjects were told to make as accurate judgments as possible but were also told that subsequent tasks awaited them. They were asked to proceed as rapidly as possible without sacrificing accuracy. To increase their awareness of time pressure, an assistant recorded elapsed time in ten-second intervals on a visible blackboard. Subjects were asked to record the elapsed time on their booklet when they finished. Subjects in the "low time pressure" (LTP) condition were told their only task was to accurately judge the cars. Each was told he would have 40 seconds to consider the information available and should use the entire period. Only when the end of each 40 second interval was signaled by the assistant could he record his judgment and proceed to the next car. The length of a

40 second interval was demonstrated to dramatize that it offered plenty of processing time. In the "undefined time pressure" (UTP) condition, instructions were similar to the LTP condition but no mandatory deliberation period was imposed. Subjects were told to proceed at whatever pace suited them. After completing the judgment task, subjects were asked "How much time pressure did you feel while making your judgments?" They responded on a five point scale with endpoints labeled "very much pressure" and "very little pressure".

Distraction Treatments

Distraction treatments weren't crossed with time pressure treatments. Three levels of distraction were created. In all three, subjects were given an introduction similar to the UTP condition, and were also forwarned that some noise would accompany their task to simulate a natural decision environment. In the "high distraction'" (HD) condition, a taped excerpt from a radio talk show (question and answer format, including commercials) was played at a moderately high volume through the remainder of the task. In the "moderate distraction" (MD) condition, the same tape was played at low volume. In the "low distraction" (LD) condition, taped background music from an FM station was played. In all conditions subjects were assured their primary task was to accurately evaluate the cars. After the judgment task, each was asked "How distracting did you find the noise from the tape recording while making your judgments?" They responded on a five point scale with endpoints labeled "very distracting" ans "not very distracting". In addition, they were asked to describe any methods they used to handle the distractions.

Subjects

Subjects were 210 male undergraduates enrolled in a business curriculum and approaching graduation. Each was randomly assigned to one of the three time pressure conditions (final cell size of forty) or one of the three distraction conditions (final cell size of thirty).

Results

Treatment Validations

Mean time-per-judgment recorded by subjects in the HTP condition was 12.2 seconds compared with the standard 40 seconds in LTP. Exact time keeping for subjects in UTP was difficult but experimenters' estimates show an average total time of 10 minutes, or about 20 seconds per judgment. Time _used_ isn't the optimal measure of perceived time pressure though. Mean ratings og perceived time pressure were 4.67, 2.70, and 2.12 for the HTP, LTP, and UTP treatments respectively. HTP subjects felt more time pressure than either of the other groups, which didn't differ significantly ($F = 8.05$; 2, 118 _d.f._; $p < .01$).

Subjects in the distraction conditions were asked how distracting they found the extraneous noise accompanying their task. Means were 4.30, 3.19, and 1.35 for HD, MD, and LD treatments respectively ($F = 6.74$; 2, 88 d.f.; $p < .01$). Neuman-Kuels analysis showed each treatment differed significantly from each of the others.

Treatment Effects

For each subject, multiple correlations were computed between his actual judgments and those predicted by the "unbiased" model, the two

"negative bias" models, and the two "positive bias" models. For the last four, the appropriate transforms were made before the scale values were entered into the regression. Two values for a (8 and 50) were used in Eq. 3 to see what difference it made. The effect was minimal and reported results are for $a = 8$. Analysis at the level of the individual was most relevant to the question of simplifying strategies. For each subject, the model yielding the highest multiple correlation (R_{max}) was noted. The frequency with which each subject's strategy was best dewcribed by each model is shown in Table 1.

Insert Table 1 About Here

In computing these frequencies, NEG_1 and NEG_2 weren't contrasted against each other but were used alternately. The same holds for POS_1 and POS_2. NEG_1 turned out to be virtually interchangeable with NEG_2, and POS_1 for POS_2. Substitutions yielded only two reclassifications. Consequently, the relative frequencies shown in Table 1 are for POS_1 and NEG_1 and the analysis is for the the data shown. Similar analyses for R_{max} frequencies produced by all other model combinations gave similar results.

The hypothesis was that operating under pronounced time pressure or distraction would induce a general tendancy among subjects to rely heavily on negative evidence. Examining first the time pressure effect, no systematic pattern in the weighting tactics of LTP or UTP subjects is apparent.All three models provide optimal fits for about the same number of subjects. Howeverr approximately two-thirds of the subjects operating under high time pressure were best fit by the model assuming heavy weighting of negative data. An overall chi-square test gave a value of 14.62 (4 d.f., $p < .01$). Comparing the HTP subjects with the

collapsed samples from the other two conditions gave a chi-square value of 13.83 (2 d.f., $p < .001$). Subjects forced to assimilate multiple cues under time pressure did differ from their counterparts handling the same information under less pressure.

In the distraction study, the emerging patterns are somewhat different. Again, the least strainful condition (LD) produced no evidence that subjects displayed anything but personal idiosyncracies in the way they weighted data. Greater frequency of negative bias did occur when a moderate level of distracting noise surrounded the task. Sixty percent of the subjects in the MD treatment were best bit by NEG_1. Yet this pattern didn't repeat itself when distractions increased (HD). Overall chi-square analysis gave a value of 8.62, with four degrees of freedom, $p < .08$. Comparing the moderate distraction group against the collapsed LD and HD groups gave a chi-square of 7.30 (2 d.f., $p < .05$). This analysis offers tentative support for the hypothesized dependence on negative data when distractions placed a strain on attention.

If limiting the nature and amount of the data used is a preferred tactic for handling high information load, the number of separate dimensions subjects consulted in making their judgments might reflect this. Consequently, the number of dimensions with statistically significant ($p < .05$) regression coefficients was calculated for each subject. This gave an estimate of how many factors had been systematically related by the processor to the final judgment. The maximum was five. Mean number of significant dimensions per subject was 1.50, 2.33, and 2.08 for the HTP, LTP, and UTP conditions, respectively.

One way analysis-of-variance indicated significant differences between the three conditions ($F = 4.45$; 1, 118 d.f.; $p < .05$). Neuman Kuels analysis showed the HTP group used significantly fewer dimensions than the other two groups, which didn't differ. In the distraction study, mean dimensions per subject was .93, 1.53, and 2.15 for the HD, MD, and LD groups, respectively. Similar analyses showed the HD subjects used fewer dimensions than either the MD or LD subjects, and the MD group fewer than the LD group ($F = 6.32$; 1, 88 d.f.; $p < .05$).

Just how adequate were any of these models in describing the strategies subjects used? Frequent best-fits for NEG_1 where predicted would be less meaningful if multiple correlations were low. Mean multiple correlations for the models are shown in Table 2. After transforming the multiple correlations via Fisher's z transform, separate 3 x 3 ANOVAs were run for the time pressure and distraction studies. In the time pressure study, the main effects of time pressure ($F = 46.54$; 2,118 d.f.; $p < .001$) and model ($F = 6.86$; 2,236 d.f.; $p < .05$) were significant, as was the interaction ($F = 37.23$; 4,236 d.f.; $p < .001$). The time pressure effect, due to the somewhat lower correlations in HTP, was anticipated by the preceding analysis of number of significant dimensions per subject. The interaction, also expected from preceding individual level analyses, was due to higher correlations for NGE_1 in HTP vs. the comparably high correlations for all three models in LTP and UTP.

The repeated-measures ANOVA for the distraction study yielded a significant main effect for distraction ($F = 67.63$; 2, 88 d.f.; $p < .001$) and a significant interaction effect ($F = 12.88$; 4,176 d.f.; $p < .001$).

The models effect wasn't significant ($F = 2.32$; 2, 176d.f., n.s.). The expected interaction was due to the relatively higher correlation of NEG_1 in the MD condition vs. comparable correlations in the other distraction conditions. The relatively poor fits generally found in the high distraction condition suggest the manipulation may have disrupted the subjects' processing so much they became erratic. Hence the negative bias found among MD subjects failed to hold for the overstrained HD subjects. Such an interpretation is partially supported by subjects' posttask descriptions of how they coped with the distractions. HD subjects tended to report frustration and an awareness of inconsistency more often than MD subjects.

As one final test of how well a negative bias model did in explaining the adjustments of subjects in the HTP and MD conditions, the R_{max} for subjects in these two conditions was compared to the median R_{max} for the two conditions. In HTP, 17 of the 26 subjects best fit by NEG_1 fell above the median R_{max} for that condition (.635). The corresponding figures for the unbiased and positive bias models were 1 of 5 and 3 of 9 respectively. In MD 10 of the 18 subjects best fit by NEG_1 fell above the sample median (.6[illegible]5). Corresponding figures for the unbiased and positive bias models were 1 of 5 and 3 of 7 respectively.

Discussion

The proportionately greater frequency of best-fits afforded by the negative bias model in the high time pressure and moderate distraction conditions appears to support the hypothesis. A tendency for people to accentuate negative evidence when the environment discourages leisurely processing may be indicated. A complementary tendency to use fewer attributes in the same circumstance is also indicated. The "harassed" decision maker is pictured as becoming extremely alert to discrediting evidence on a few salient dimensions.

The perspective taken here on how people use evidence in evaluating alternatives echoes that of Shepard (1964) and Tversky (1972) in emphasizing a person's immediate "state of mind" as the major determinant of the weights applied. Repeated findings of task effects on data weighting policies and of intransitivity in choices seem to argue against traditional ideas of a stable utility function dictating a weighting scheme which consistently molds a decision maker's evaluation policy across situations. The weight a person gives to some aspect of the decision problem is in part a function of stable goals and in part a function of immediately salient subgoals. The latter may dominate the former under certain circumstances, and vice versa. The question of interest then becomes identifying the conditions that lead a judge to deviate from his optimal "rational" strategy (if such a notion is meaningful) and trying to discover whatever stability exists in the manner in which he deviates under those conditions. Situational factors related to information overload, two of which were examined in this study, seem a promising starting point.

A limitation of fitting mathematical models to input-output data is the remaining ambiguity about the underlying processes. Each of the models used here was literally an additive, compensatory model. The conservative interpretation of the results must therefore be in terms of differential weighting of negative evidence by compensatory data processors. However, NEG_1 and NEG_2 may both be viewed as approximations to a noncompensatory conjunctive strategy. For example, Einhorn (1971) has proposed that if Eq. 2 incorporates a log transform of the input [illegible]

values on the left side of the equation, it may be treated as a conjunctive model. Since NEG_2 bends the scale values even more sharply than NEG_1, it might also be seen as a reasonable approximation to a multiple cutoff strategy. Some may therefore be willing to interpret the results as indicating more frequent use of multiple cutoff strategies under difficult conditions. Several researchers have, however, cautioned against treating math models like these as close enough approximations to a conjunctive model to warrant such an interpretation (e.g., Goldberg, 1971; Birnbaum, 1973). Clearly, more rigorous tests relying more on introspective reports from subjects than this study did are necessary to sort out the precise interpretation.

The judgment task in this study was created so that certain factors conducive to discovering a negative bias were present. These included options offering both positive and negative features, options requiring personal investment, and a final commitment evaluation context. The present results don't indicate whether these are necessary factors or not. We might speculate though that a decision maker evaluating options on a more tentative basis ("which deserve more information search?") might react to similar difficult conditions by accentuating postive data. Cost and reward perceptions should be a major determinant of the simplifying tactic adopted.

Subjects in the distraction study could not, practically speaking, avoid the extraneous noise; those under high time pressure had little incentive to proceed slowly (even though they set their own pace). Even where judgments are very important, decision makers may often find

it practically impossible to meet a deadline or find total peace and quiet. Or incentives to take the trouble of handling information overload in these ways may be low. The type of adaptations found in this study might then be put into use. Of course, a decision maker may often find he can control tempo and distractions when the judgments to be made are sufficiently important.

If these subjects had had considerable experience integrating evidence about cars under difficult conditions, they might have developed individualized shortcuts idiosyncratic to the topic of cars. An interesting question for future research is whether people who consistently operate in noisy, pressurized environments continue to accentuate negative evidence or develop other shortcuts. Such people might have the benefit of feedback which these subjects didn't. It isn't clear whether the types of feedback usually available to consumers or managers would sensitize them to the deviations they introduce in trying to simplify. At a minimum they would need feedback under ideal conditions for insight into their preferred judgment policies, and feedback about the outcomes of judgments made when harassed soon enough after the actual judgment to recall the conditions surrounding it. It would seem much experience is necessary for a person to realize the locus of incorrect judgments lies in his simplifying adaptations, not in his preferred judgment policy. It seems time that judgmental research became more concerned with the task conditions systematically affecting the use of different judgmental strategies rather than general model building without concern for the task environment.

Table 1

R_{max} Frequencies for Time Pressure

and Distraction Conditions

Data Usage Model	Time Pressure		
	High	Low	Undefined
Unbiased	5	14	15
Negative bias (NEG_1)	26	11	13
Positive bias (POS_1)	9	15	12
	Distraction		
	High	Moderate	Low
Unbiased	9	5	11
Negative bias (NEG_1)	9	18	9
Positive bias (POS_1)	12	7	10

Table 2

Mean Multiple Correlations for

Time Pressure and Distraction Conditions

Data Usage Model	Time Pressure			
	High	Low	Undefined	
Unbiased	.558	.703	.690	.650
Negative bias (NEG_1)	.622	.721	.696	.679
Positive bias (POS_1)	.536	.679	.719	.645
	.572	.701	.703	

	Distraction			
	High	Moderate	Low	
Unbiased	.502	.630	.720	.614
Negative bias (NEG_1)	.476	.678	.703	.619
Positive bias (POS_1)	.470	.619	.728	.606
	.483	.646	.714	

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